

## WHAT IS CLAIMED IS:

1           1.   For use in a transceiver, an adaptive data  
2 insertion mechanism for inserting data within a transport  
3 stream without destructive disturbance comprising:

4               a bandwidth estimator producing an estimate of  
5 future available bandwidth within said transport stream;

6               a scheduler prioritizing and scheduling insertion  
7 of content to be inserted within said transport stream  
8 based upon said estimate of future available bandwidth and  
9 characteristics of said insertion content; and

10              an insertion unit inserting scheduled insertion  
11 content within said transport stream by replacement of  
12 selected replaceable content within said transport stream  
13 to form a new transport stream.

1           2.   The adaptive data insertion mechanism as set  
2 forth in Claim 1 wherein said bandwidth estimator produces  
3 said estimate of future available bandwidth from periodic  
4 bandwidth utilization measurements for said transport  
5 stream and information regarding current and future  
6 programming to be transmitted by said transport stream.

1           3. The adaptive data insertion mechanism as set  
2 forth in Claim 1 wherein said insertion unit replaces  
3 selected packets within said transport stream which include  
4 one of one or more selected packet type identifiers with  
5 packets for said insertion content while passing packets  
6 which include packet type identifiers other than said  
7 selected packet type identifiers to form said new transport  
8 stream.

1           4. The adaptive data insertion mechanism as set  
2 forth in Claim 3 wherein said insertion unit replaces null  
3 packets within an MPEG-2 transport stream.

1           5.    A transceiver comprising:

2                   a   input   connection   receiving   an   incoming  
3   transport stream;

4                   an output connection from which a new transport  
5   stream is transmitted, said new transport stream including  
6   at least portions of said incoming transport stream; and

7                   an adaptive data insertion mechanism for inserting  
8   data within said incoming transport stream without  
9   destructive disturbance comprising:

10                   a bandwidth estimator producing an estimate  
11   of future available bandwidth within said incoming  
12   transport stream;

13                   a scheduler prioritizing and scheduling  
14   insertion of content to be inserted within said new  
15   transport stream based upon said estimate of future  
16   available bandwidth and characteristics of insertion  
17   content obtained from a source separate from said  
18   incoming transport stream; and

19                   an insertion unit inserting scheduled  
20   insertion content within said new transport stream by  
21   replacement of selected replaceable content within  
22   said incoming transport stream to form said new  
23   transport stream.

1           6.    The transceiver as set forth in Claim 5 wherein  
2   said bandwidth estimator produces said estimate of future  
3   available bandwidth from periodic bandwidth utilization  
4   measurements for said incoming transport stream and  
5   information regarding current and future programming to be  
6   transmitted by said incoming transport stream.

1           7.    The transceiver as set forth in Claim 5 wherein  
2   said insertion unit replaces selected packets within said  
3   incoming transport stream which include one of one or more  
4   selected packet type identifiers with packets for said  
5   insertion content while passing packets which include  
6   packet type identifiers other than said selected packet  
7   type identifiers to form said new transport stream.

1           8.    The transceiver as set forth in Claim 6 wherein  
2   said insertion unit replaces null packets within an MPEG-2.  
3   transport stream.

1           9. For use in a transceiver, a method of adaptive  
2 data insertion within a transport stream without  
3 destructive disturbance comprising:

4           producing an estimate of future available  
5 bandwidth within the transport stream;

6           prioritizing and scheduling insertion of content  
7 to be inserted within the transport stream based upon the  
8 estimate of future available bandwidth and characteristics  
9 of insertion content; and

10           inserting scheduled insertion content within the  
11 transport stream by replacement of selected replaceable  
12 content within the transport stream to form a new transport  
13 stream.

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1           11. The method as set forth in Claim 9 wherein the  
2       step of inserting scheduled insertion content within the  
3       transport stream by replacement of selected replaceable  
4       content within the transport stream to form a new transport  
5       stream further comprises:

6           replacing selected packets within the transport  
7       stream which include one of one or more selected packet  
8       type identifiers with packets for the insertion content  
9       while passing packets which include packet type identifiers  
10      other than the selected packet type identifiers to form the  
11      new transport stream.

12           12. The method as set forth in Claim 11 wherein the  
13      step of replacing selected packets within the transport  
14      stream which include one of one or more selected packet  
15      type identifiers with packets for the insertion content  
16      while passing packets which include packet type identifiers  
17      other than the selected packet type identifiers to form the  
18      new transport stream further comprises:

19           replacing selected null packets within an MPEG-2  
20      transport stream.

1           13. A computer program product within a computer  
2 usable medium for adaptive data insertion within a  
3 transport stream without destructive disturbance  
4 comprising:

5           instructions for producing an estimate of future  
6 available bandwidth within the transport stream;

7           instructions for prioritizing and scheduling  
8 insertion of content to be inserted within the transport  
9 stream based upon the estimate of future available  
10 bandwidth and characteristics of insertion content; and

11           instructions for inserting scheduled insertion  
12 content within the transport stream by replacement of  
13 selected replaceable content within the transport stream to  
14 form a new transport stream.

1           14. The computer program product as set forth in  
2 Claim 13 wherein the instructions for producing an estimate  
3 of future available bandwidth within the transport stream  
4 further comprise:

5           instructions for producing the estimate of future  
6 available bandwidth from periodic bandwidth utilization  
7 measurements for the transport stream and information  
8 regarding future programming to be transmitted on the  
9 transport stream.

1           15. The computer program product as set forth in  
2 Claim 14 wherein the instructions for inserting scheduled  
3 insertion content within the transport stream by  
4 replacement of selected replaceable content within the  
5 transport stream to form a new transport stream further  
6 comprise:

7           instructions for replacing selected packets  
8 within the transport stream which include one of one or  
9 more selected packet type identifiers with packets for the  
10 insertion content while passing packets which include  
11 packet type identifiers other than the selected packet type  
12 identifiers to form the new transport stream.



1           16. The computer program product as set forth in  
2           Claim 15 wherein the instructions for replacing selected  
3           packets within the transport stream which include one of  
4           one or more selected packet type identifiers with packets  
5           for the insertion content while passing packets which  
6           include packet type identifiers other than the selected  
7           packet type identifiers to form the new transport stream  
8           further comprise:

9                   instructions for replacing selected null packets  
10           within an MPEG-2 transport stream.

1           17. A data transport stream comprising:

2           a first portion derived from a transport stream;

3           and

4           a second portion derived from insertion content,  
5           wherein a ratio of the first portion to the second portion  
6           is determined by an estimate of available bandwidth within  
7           said transport stream representing selected replaceable  
8           content within said transport stream and by insertion of  
9           said insertion content by replacement of said selected  
10          replaceable content within said transport stream with  
11          portion of said insertion content to form said data  
12          transport stream.

1           18. The data transport stream as set forth in Claim  
2           17 wherein said estimate of available bandwidth within said  
3           transport stream is derived from periodic bandwidth  
4           utilization measurements for said transport stream and  
5           information regarding future programming to be transmitted  
6           on said transport stream.

1           19. The data transport stream as set forth in Claim  
2           17 wherein:

3                 said first portion further comprises packets  
4           within said transport stream which include packet type  
5           identifiers other than one or more selected packet type  
6           identifiers; and

7                 said second portion further comprises packets for  
8           said insertion content in place of packets within said  
9           transport stream which include one of said one or more  
10          selected packet type identifiers.

11           20. The data transport stream as set forth in Claim  
12           19 wherein said second portion further comprises packets  
13           for said insertion content in place of null packets within  
14           an MPEG-2 transport stream forming the transport stream.